

CLAIMS

- 1 1. A heat collector for a cooling system of an electronic display, comprising:
2 a heat sink in conjunction with a display screen of the electronic display; and
3 a liquid phase line and a gas phase line fluidly connected to each other and
4 thermally connected to the heat sink.

- 1 2. The heat collector of claim 1, wherein:
2 the heat sink has a channel receiving at least a portion of the gas phase line.

- 1 3. The heat collector of claim 2, wherein the channel is serpentine and the gas phase
2 line is serpentine and fits into the channel.

- 1 4. The heat collector of claim 2, further comprising a thermally conductive material
2 between the portion of the gas phase line and the heat sink to improve conductive
3 heat transfer.

- 1 5. The heat collector of claim 2, wherein the liquid phase line extends coincidently
2 with the portion of the gas phase line.

- 1 6. The heat collector of claim 5, wherein the liquid phase line is disposed inside the
2 gas phase line.

- 1 7. The heat collector of claim 5, wherein the liquid phase line is integral with the gas
2 phase line.

- 1 8. The heat collector of claim 1, wherein the gas phase line is at least partially
2 formed by a portion of the heat sink.

- 1 9. The heat collector of claim 8, wherein the liquid phase line is at least partially
2 formed by a portion of the heat sink.
- 1 10. The heat collector of claim 1, further comprising:
2 a heat sink cover plate mounted to the heat sink with at least a portion of the gas
3 phase line between the heat sink cover plate and the heat sink.
- 1 11. The heat collector of claim 1, further comprising through holes in the heat sink for
2 receiving fasteners therethrough.
- 1 12. The heat collector of claim 1, wherein the heat sink has an opening for inlet and
2 outlet, the opening receiving both the gas phase line and the liquid phase line
3 therethrough.
- 1 13. The heat collector of claim 12, further comprising:
2 a manifold with an input connection for receiving the liquid phase line and an
3 output connection for receiving the gas phase line; and
4 the manifold having a combination output and input connection fluidly connected
5 to the opening for inlet and outlet of the heat sink;
6 wherein the manifold combines the gas phase line and the liquid phase line into a
7 composite line comprising at least a portion of the gas phase line and a portion of the
8 liquid phase line.
- 1 14. The heat collector of claim 13, wherein the manifold is integral with the heat sink
- 1 15. The heat collector of claim 13, wherein the manifold is added to the heat sink.

- 1 16. A heat collector, comprising:
2 a heat sink including a mass of heat conductive material; and
3 a recess in the mass of material;
4 at least a gas phase line in the recess;
- 1 17. The heat collector of claim 16, further comprising:
2 a liquid phase line in the recess.
- 1 18. A heat collector of claim 17, wherein the liquid phase line is disposed inside the
2 gas phase line.
- 1 19. A heat collector of claim 18, wherein a downstream end of the liquid phase line is
2 fluidly connected to and forms a transition into the gas phase line.
- 1 20. A heat collector of claim 19, wherein the transition is adjacent to an upstream end
2 of the gas phase line.
- 1 21. The heat collector of claim 17, wherein the liquid phase line is at least partially
2 coextensive with the gas phase line.
- 1 22. The heat collector of claim 17, wherein the liquid phase line extends along a
2 substantial portion of the gas phase line.
- 1 23. The heat collector of claim 16, wherein:
2 the recess is a longitudinal recess; and
3 a first end of the recess comprises an opening in the heat sink,
4 the opening being an inlet and outlet opening.
- 1 24. The heat collector of claim 23, wherein a second end of the recess comprises a
2 closed end within the mass of heat conductive material.

- 1 25. The heat collector of claim 24, further comprising a liquid phase line in the recess
2 extending substantially to the closed end of the recess;
3 wherein the closed end of the recess forms a transition between the liquid phase
4 line and the gas phase line.
- 1 26. The heat collector of claim 16, further comprising a composite line including a
2 plurality of lines including said gas phase line.
- 1 27. The heat collector of claim 26, wherein the composite line is received in the
2 recess.
- 1 28. The heat collector of claim 26, further comprising:
2 a manifold for uniting a separate gas phase line and a separate liquid phase line
3 into the composite line; and
4 the manifold having a combined gas phase and liquid phase connection fluidly
5 connected to the composite line.
- 1 29. The heat collector of claim 28, wherein the manifold has an upstream liquid phase
2 input connection and a downstream gas phase output connection separate from the
3 liquid phase inlet connection.
- 1 30. A plurality of liquid phase and gas phase lines for a cooling system, comprising:
2 an internal gas phase line;
3 an external gas phase line connected to the internal gas phase line; and
4 an external liquid phase line;
5 wherein the external liquid phase line and the external gas phase line have
6 substantially the same diameter.
- 1 31. The plurality of liquid phase and gas phase lines in claim 30, further comprising
2 an internal liquid phase line.

1 32. The plurality of liquid phase and gas phase lines in claim 2, wherein the internal
2 liquid phase line is disposed inside and extends along a major portion of the
3 internal gas phase line.

1 33. The plurality of liquid phase and gas phase lines in claim 31, further comprising:
2 a manifold;
3 the manifold having: a liquid phase input connection fluidly connected to the
4 external liquid phase line, a gas phase output connection fluidly connected to the external
5 gas phase line; and
6 a combined gas phase and liquid phase connection fluidly connected to the
7 internal gas phase line and the internal liquid phase line.

1 34. The plurality of liquid phase and gas phase lines in claim 31, wherein the internal
2 gas phase line and the internal liquid phase line form a composite internal line.

1 35. The plurality of liquid phase and gas phase lines in claim 34, wherein the
2 composite internal line has a first end fluidly connected to a manifold and a
3 second end fluidly connecting the internal liquid phase line to the internal gas
4 phase line and forming a transition therebetween.

1 36. The plurality of liquid phase and gas phase lines of claim 35, wherein the internal
2 liquid phase line is disposed inside the internal gas phase line.

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